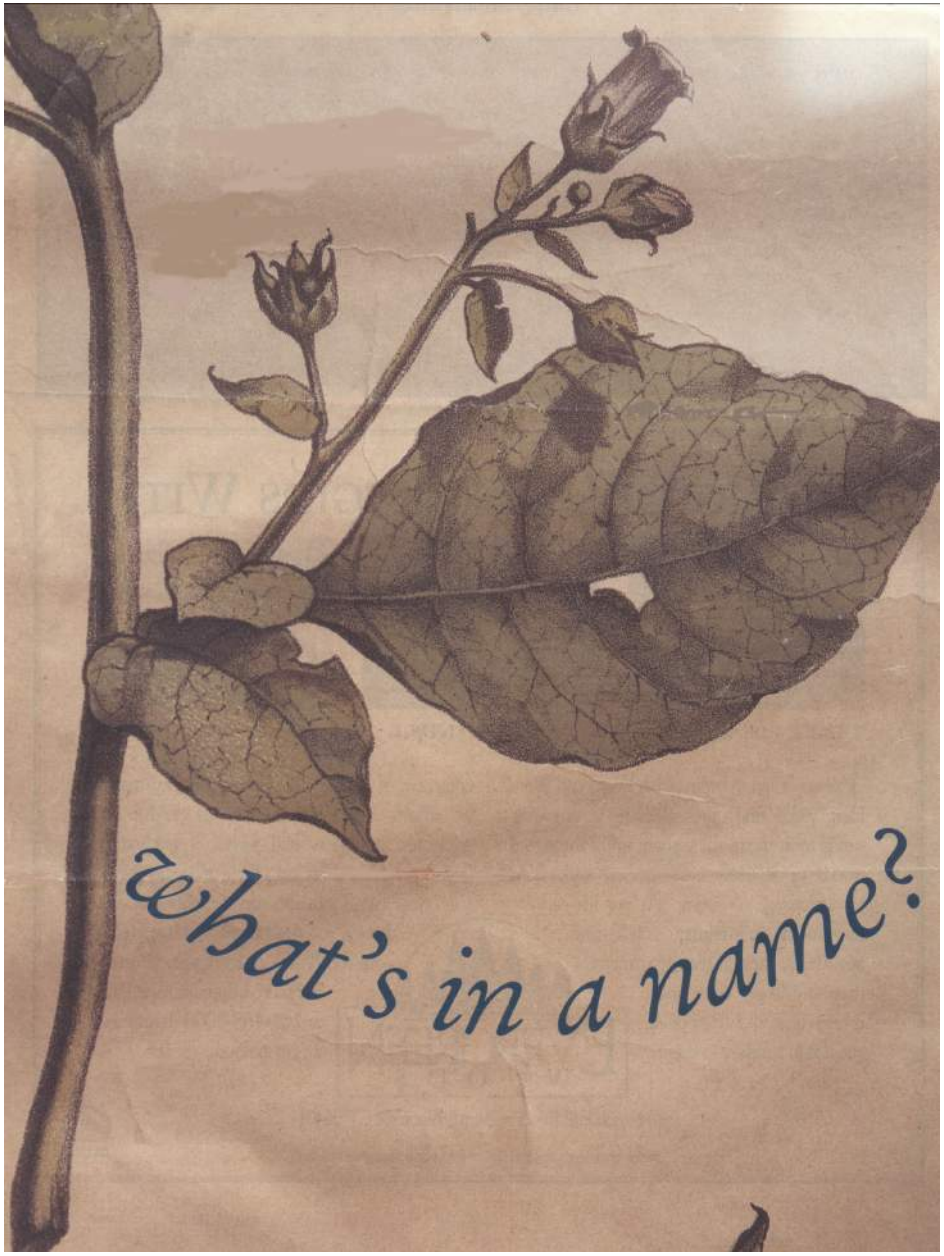


Nomenclature

"NAMING THINGS IS THE OLDEST FORM OF SCIENCE AND ONE OF THE FIRST HUMAN ACTIVITIES. LINNAEUS SOUGHT TO DISCOVER GOD'S PLAN."

Nomenclature - Using Names

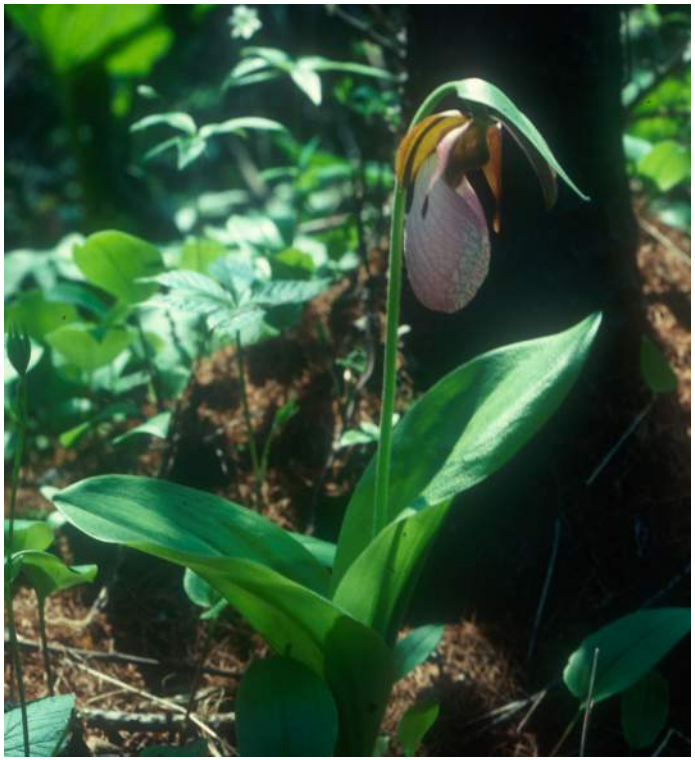
We are surrounded by a wealth of diversity and one of the goals of systematics is to **inventory** the amazing magnitude of species on Earth which is estimated to be in the 10s or 100s of millions; 1.4 million species have been described; specifically for Michigan there are 32,000+ spp., and in terms of vascular plants 2570 spp.

Two other goals (among many) for Systematics:

1. **Identify** and **name** species
2. **Classify** or place the species in groups

Plantae	Kingdom
Magnoliophyta	Phylum
Liliopsida	Class
Asparagales	Order
Orchidaceae	Family
Cypripedium	Genus
Cypripedium acaule	Species

Hierarchical classification



Cypripedium acaule
Stemless lady slipper

Nomenclature - Using Names

Nomenclature = a system of naming

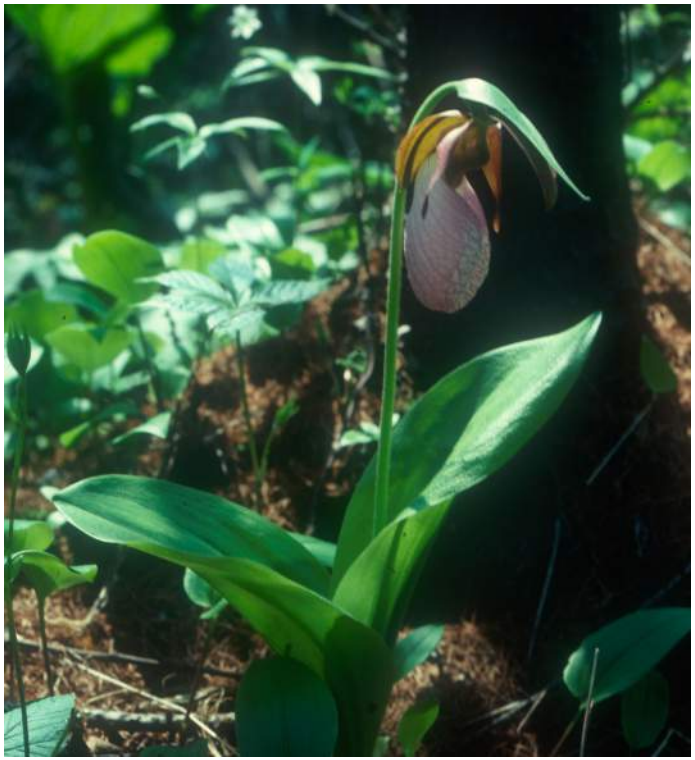
Common names

What are their advantages?

- colorful and easy to remember
- for most, only means of communication about earth's diversity

What are their disadvantages?

- One plant can have many names



Stemless lady slipper
Moccasin flower
Pink lady slipper

Nomenclature - Using Names

Nomenclature = a system of naming

Common names

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What are their disadvantages?

- One plant can have many names

Garden pansy
+ 200 other names!

Nomenclature - Using Names

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Common names

What are their advantages?

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What are their disadvantages?

- One plant can have many names
- One name can be given to unrelated plants

Fireweed
Epilobium
(Onagraceae)

Fireweed
Erechtites
(Asteraceae)

Nomenclature - Using Names

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Common names

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Loosestrife
Lythrum
(Lythraceae)

Loosestrife
Lysimachia
(Primulaceae)

Nomenclature - Using Names

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Common names

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What are their disadvantages?

- One plant can have many names
- One name can be given to unrelated plants
- Names can be confusing or misleading

Sweet fern
(not a fern!)

Nomenclature - Using Names

Nomenclature = a system of naming

Common names

What are their advantages?

- colorful and easy to remember
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What are their disadvantages?

- One plant can have many names
- One name can be given to unrelated plants
- Names can be confusing or misleading

Pineapple
(not a conifer
nor an apple!)

Nomenclature - Using Names

Nomenclature = a system of naming

Common names

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What are their disadvantages?

- One plant can have many names
- One name can be given to unrelated plants
- Names can be confusing or misleading

  Hyphens often used with non-relationship of two terms

Red oak
(type of oak)

Poison sumac
(type of sumac)

Poison-oak
(type of sumac, not oak)

Nomenclature - Using Names

Nomenclature = a system of naming

Common names

What are their advantages?

- colorful and easy to remember
- for most, only means of communication about earth's diversity

What are their disadvantages?

- One plant can have many names
- One name can be given to unrelated plants
- Names can be confusing or misleading
- Many plants have no common names

Carex buxbaumii
?

Buxbaum's sedge

Nomenclature - Using Names

Scientific names

The principles and rules of botanical nomenclature have been developed and adapted by a series of International Botanical Congresses and are listed in the International Code of Botanical Nomenclature:

the major goal of nomenclature is to provide one correct name for each taxonomic group within a stable system of names

Carex buxbaumii Wahlenb.

Nomenclature - Using Names

Scientific names

Scientific names also can be pleasing to the ear and often make sense if one understands a little Latin or Greek

May-apple

Podophyllum peltatum - “umbrella foot leaf”

Nomenclature - Using Names

Scientific names

Species names : **binomial** system which was first consistently used by Carolus Linneaus

Genus name: *Podophyllum*

Specific epithet: *peltatum*

Species name: *Podophyllum peltatum*

Authority: Linnaeus (abbreviated "L.") - the name of the person or persons who first coined this name for this species

Scientific name is the genus + specific epithet + authority

Podophyllum peltatum L.

Nomenclature - Using Names

Scientific names - general rules

- Italics or underlined
- Generic name MUST ALWAYS be capitalized
- Species epithet MAY ALWAYS be lower case
- Species epithet should NEVER be used alone
- The first name is a singular noun and the second word is an adjective modifying the genus name. Because botanical nomenclature is Latin, the species epithet must agree in gender with the genus.

Podophyllum peltatum L.

Nomenclature - Using Names

Scientific names - general rules

- The same specific epithet can be used for different species in different genera but only once within a genus.

Quercus rubra - red oak

Acer rubrum - red maple

Nomenclature - Using Names

Scientific names - general rules

- The same genus name can **not** be used for other plant groups; but plant nomenclature is **independent** from animal or fungi nomenclature

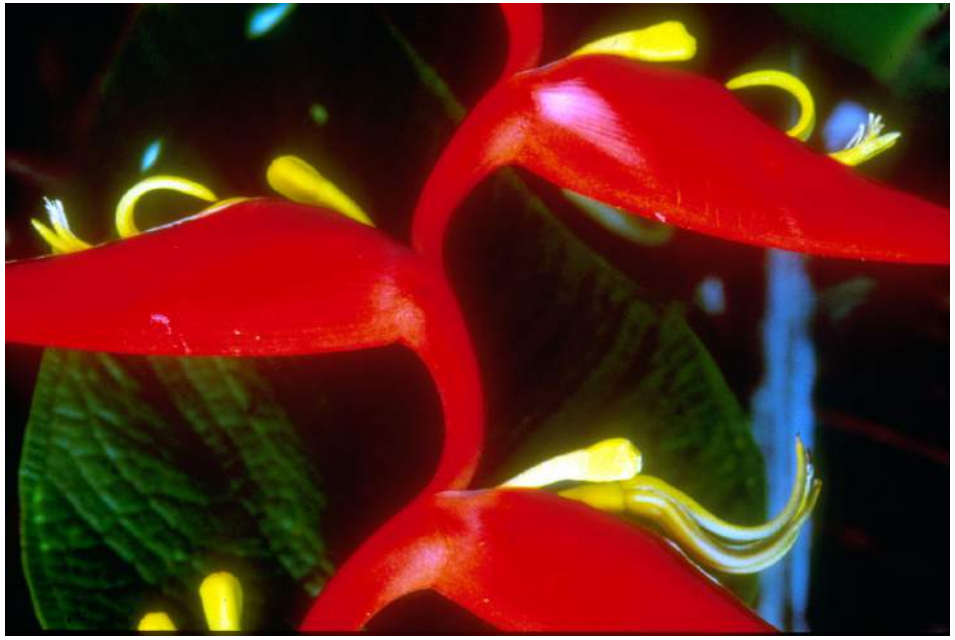
Cecropia - moth

Cecropia - tropical tree

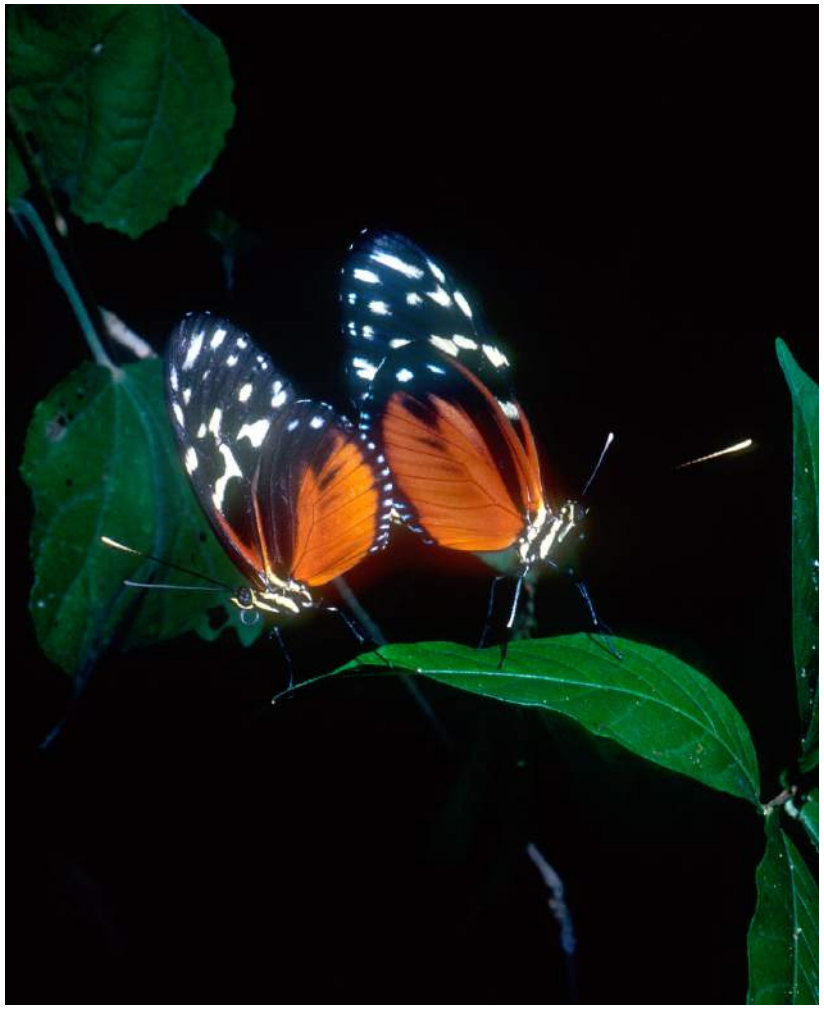
Nomenclature - Using Names

Scientific names - general rules

- The same genus name can **not** be used for other plant groups; but plant nomenclature is **independent** from animal or fungi nomenclature



Heliconia - banana relative



Heliconius - picture wings

Nomenclature - Using Names

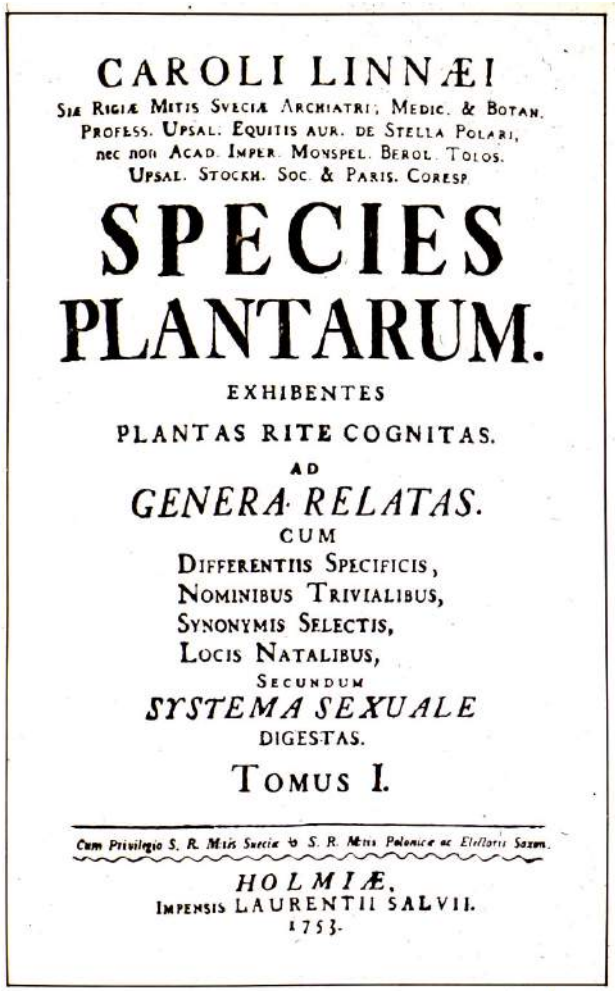
Scientific names - why binomials?

Carolus Linnaeus on a field trip - using **polynomials**

Serratula noveboracensis

Nomenclature - Using Names

Scientific names - why binomials?



CAROLI LINNÆI

SIÆ REGIÆ MITIS SVECIÆ ARCHIATRI, MEDIC. & BOTAN. PROFESS. UPSAL. EQUITIS AUR. DE STELLA POLARI, nec non ACAD. IMPER. MONSPEL. BEROL. TOLOS. UPSAL. STOCKH. SOC. & PARIS. CORESP.

SPECIES PLANTARUM.

EXHIBENTES

PLANTAS RITE COGNITAS.

AD

GENERA RELATAS.

CUM

DIFFERENTIIS SPECIFICIS,
NOMINIBUS TRIVIALIBUS,
SYNONYMIS SELECTIS,
LOCIS NATALIBUS,

SECUNDUM

SYSTEMA SEXUALE

DIGESTAS.

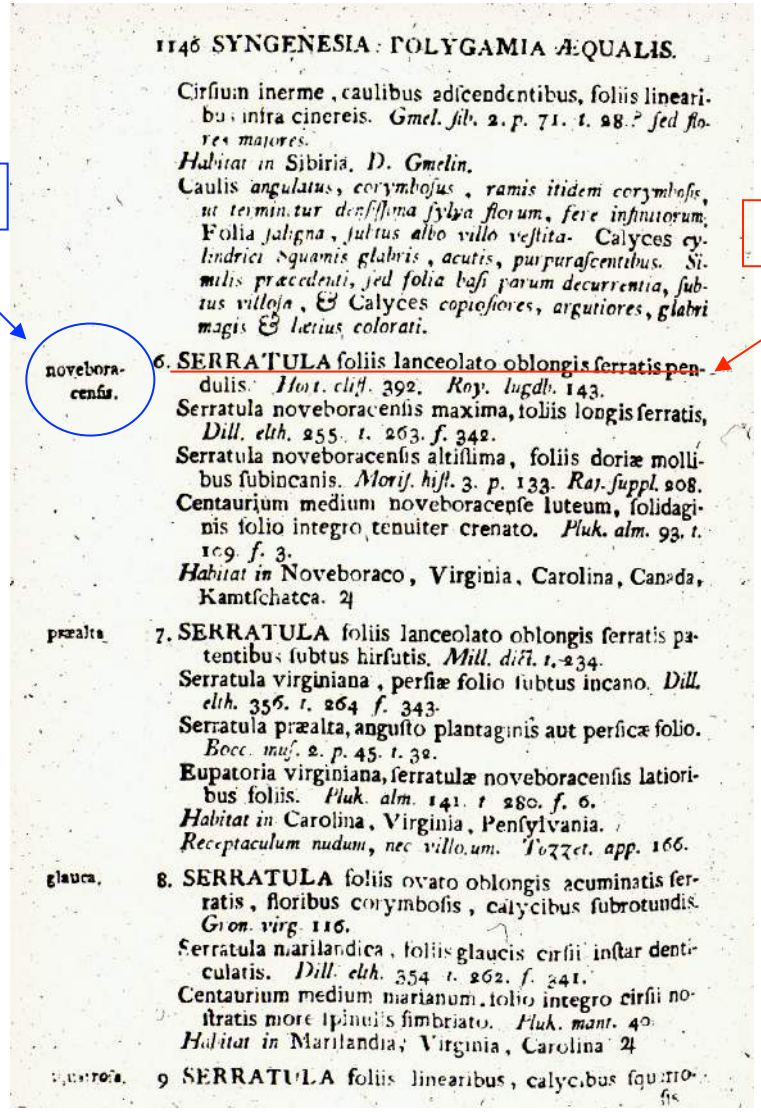
TOMUS I.

Cum Privilegio S. R. Mtis Sueciæ & S. R. Mtis Polonicæ ac Electoris Saxon.

HOLMIÆ,
IMPENSIS LAURENTII SALVII.
1753.

binomial

polynomial



1146 SYNGENESIA: POLYGAMIA ÆQUALIS.

Cirsium inerme, caulibus adscendentibus, foliis linearibus infra cinereis. *Gmel. sib.* 2. *p.* 71. *t.* 28.? *sed flores majores.*
Habitat in Sibiria. *D. Gmelin.*
Caulis *angulatus, corymbosus, ramis itidem corymbosis, ut terminatur densissima sylva florum, fere infinitorum.* Folia *subtus albo villo vestita.* Calyces *cylindrici squamis glabris, acutis, purpurascentibus. Similis præcedenti, sed folia basi parum decurrentia, subtus villosa, & Calyces copiosiores, argutiores, glabri magis & lætius colorati.*

noveboracensis. 6. SERRATULA foliis lanceolato oblongis serratis pendulis. *Hort. cliff.* 392. *Roy. lugdb.* 143.
Serratula noveboracensis maxima, foliis longis serratis, *Dill. elth.* 255. *t.* 263. *f.* 342.
Serratula noveboracensis altissima, foliis doriæ mollibus subincanis. *Morif. hist.* 3. *p.* 133. *Raj. suppl.* 208.
Centaurium medium noveboracense luteum, solidaginis folio integro tenuiter crenato. *Pluk. alm.* 93. *t.* 109. *f.* 3.
Habitat in Noveboraco, Virginia, Carolina, Canada, Kamtschatca. 4

prealta. 7. SERRATULA foliis lanceolato oblongis serratis patentibus subtus hirsutis. *Mill. dict.* 1. 234.
Serratula virginiana, persiæ folio subtus incano. *Dill. elth.* 356. *t.* 264 *f.* 343.
Serratula prælta, angusto plantaginis aut persicæ folio. *Bocc. mus.* 2. *p.* 45. *t.* 32.
Eupatoria virginiana, serratulæ noveboracensis latioribus foliis. *Pluk. alm.* 141. *t* 280. *f.* 6.
Habitat in Carolina, Virginia, Pensylvania.
Receptaculum nudum, nec villosum. Tozzet. app. 166.

glauca. 8. SERRATULA foliis ovato oblongis acuminatis serratis, floribus corymbosis, calycibus subrotundis. *Gron. virg.* 116.
Serratula marilandica, foliis glaucis cirsii instar denticulatis. *Dill. elth.* 354 *t.* 262. *f.* 341.
Centaurium medium marianum, folio integro cirsii nostratis more spinulis fimbriato. *Pluk. mant.* 40.
Habitat in Marilandia, Virginia, Carolina 4

squarrosa. 9 SERRATULA foliis linearibus, calycibus squarrosis

Nomenclature - Using Names

Scientific names - name changes

- Unfortunately very common

- Give rise to duplicate names - **synonyms** - for the same plant

Example 1:

***Carex buxbaumii* Wahlenb.** is the name given to this plant by Wahlenburg. However, Schkuhr came up with a name for a similar plant (maybe from a different region or locality) which is called ***Carex polygama* Schkuhr**. Most people consider it the same species, and thus the second name is a **synonym** of the first which has priority in terms of date it was coined.

Carex buxbaumii Wahlenb.
Carex polygama Schkuhr.

Nomenclature - Using Names

Scientific names - name changes

Example 2:

The golden ragwort was named by Linnaeus:
Senecio aureus L.

Switched to the genus *Packera* by Love & Love:
Packera aurea (L.) Love & Love

Note 4 things:

1. The name in parenthesis - Linnaeus - is the author of the specific epithet and the specific epithet has priority and is retained if possible when moved into a 2nd genus.

2. Love and Love are the authors of the binomial.

3. The gender has changed.

4. *Senecio aureus* is now a **synonym** for *Packera aurea.*

Senecio aureus L.

Packera aurea (L.) Love & Love

Nomenclature - Using Names

Scientific names - type method

Because of synonomy - proliferation of scientific names - the type method is used to track names and lessen confusion.

Every species name must be linked to an herbarium specimen and deposited in an herbarium.

holotype (type): the particular specimen or element designated by the author, which automatically fixes the application of the name.
lectotype: a specimen or element selected by a competent worker from the original material studied by the author to serve as a substitute for the holotype if the latter was not designated in the original publication or is missing. A lectotype takes precedence over the following type.
neotype: a specimen selected to serve as a substitute for the holotype when all material on which the name was based is missing.
isotype: any specimen, other than the holotype, that duplicates the holotype (from the same collection, with the same locality, date, and number as the holotype).
paratype: any specimen, other than the holotype, referred to in the original publication of the taxon. Earlier workers often referred to these as "co-types."
syntype: one of two or more specimens or elements used by the author of a taxon if no holotype was designated; or one of two or more specimens designated as types simultaneously in the original publication. The designation "co-type" has also been used here.
topotype: a specimen collected at the same locality as the holotype and therefore probably representing the same population.

Nomenclature - Using Names

Scientific names - type method

Because of synonomy - proliferation of scientific names - the type method is used to track names and lessen confusion.

Every species name must be linked to an herbarium specimen and deposited in an herbarium.

The type method continues up the hierarchical system of classification.

Solidago canadensis L. is the first named species of the genus *Solidago* and thus the Linnaean type specimen for the species is also the type specimen for the genus.

TABLE 1.1 Important categories of taxonomic hierarchy as applied to the taxon *Solidago canadensis*, goldenrod.

Category	*Ending*	*Example*[a]
Kingdom	-ota	Eukary**ota**
Division (Phylum)	-phyta	Magnoliophyta
Subdivision	-phytina	Magnoliophytina (angiosperms)
Class	-opsida	Magnoliopsida (dicotyledons)
Subclass	-idae	Asteridae
Order	-ales	Asterales
Suborder	-ineae	Magnoliineae
Family	-aceae	Asteraceae
Subfamily	-oideae	Asteroideae
Tribe	-eae	Astereae
Genus		*Solidago*
Species		*canadensis* L.

[a]Note that the recommended endings are in boldface.

Nomenclature - Using Names

Scientific names - type method

Because of synonomy - proliferation of scientific names - the type method is used to track names and lessen confusion.

Every species name must be linked to an herbarium specimen and deposited in an herbarium.

Aster novae-angliae L.

New England aster

The type method continues up the hierarchical system of classification.

Solidago canadensis L. is the first named species of the genus *Solidago* and thus the Linnaean type specimen for the species is also the type specimen for the genus.

Solidago belongs to the family Asteraceae which is typified by the genus *Aster*, and specifically *A. novae-angliae*. **Thus the type specimen for the New England aster is the type for the species, genus, and family - and order and subclass as well!**

TABLE 1.1 Important categories of taxonomic hierarchy as applied to the taxon *Solidago canadensis*, goldenrod.

Category	*Ending*	*Example*[a]
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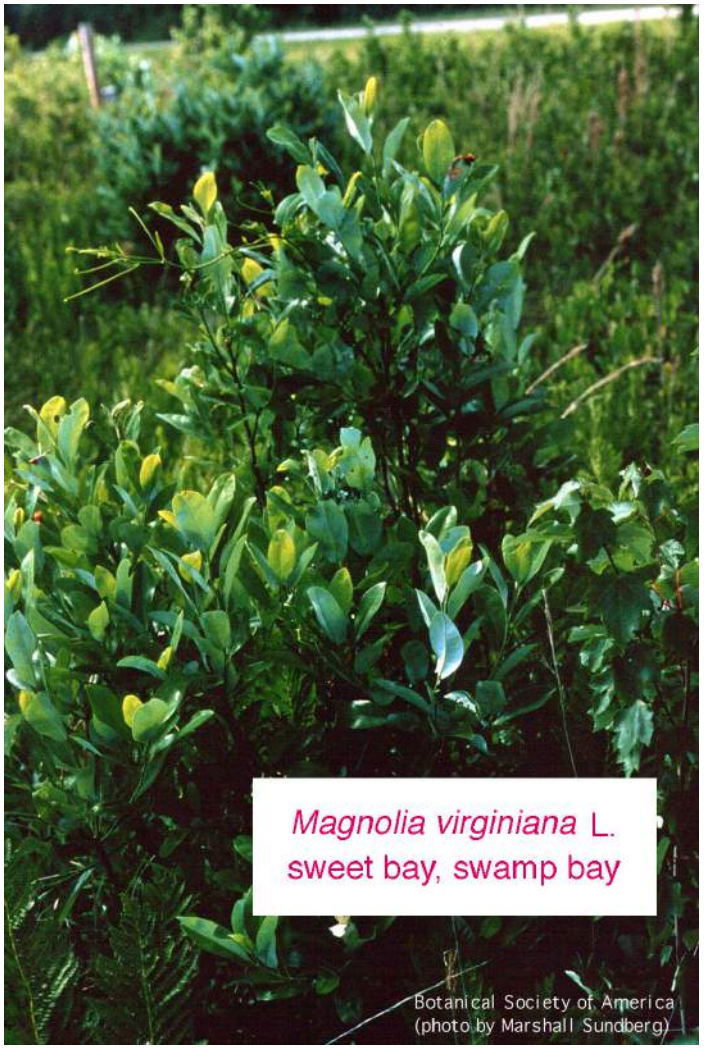
Division (Phylum)	-phyta	Magnoliophyta
Subdivision	-phytina	Magnoliophytina (angiosperms)
Class	-opsida	Magnoliopsida (dicotyledons)
Subclass	-idae	Asteridae
Order	-ales	Aster**ales**
Suborder	-ineae	Magnoli**ineae**
Family	-aceae	Asteraceae
Subfamily	-oideae	Asteroideae
Tribe	-eae	Astereae
Genus		*Solidago*
Species		*canadensis* L.

[a]Note that the recommended endings are in boldface.

Nomenclature - Using Names

Scientific names - type method



One very special species - *Magnolia virginiana* L. - from Southeastern U.S.A. - represents the type species for flowering plants often referred to as the Magnoliophyta

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Subdivision	-phytina	Magnoliop**hytina** (angiosperms)
Class	-opsida	Magnoli**opsida** (dicotyledons)
Subclass	-idae	Aster**idae**
Order	-ales	Aster**ales**
Suborder	-ineae	Magnoli**ineae**
Family	-aceae	Aster**aceae**
Subfamily	-oideae	Aster**oideae**
Tribe	-eae	Aster**eae**
Genus		*Solidago*
Species		*canadensis* L.

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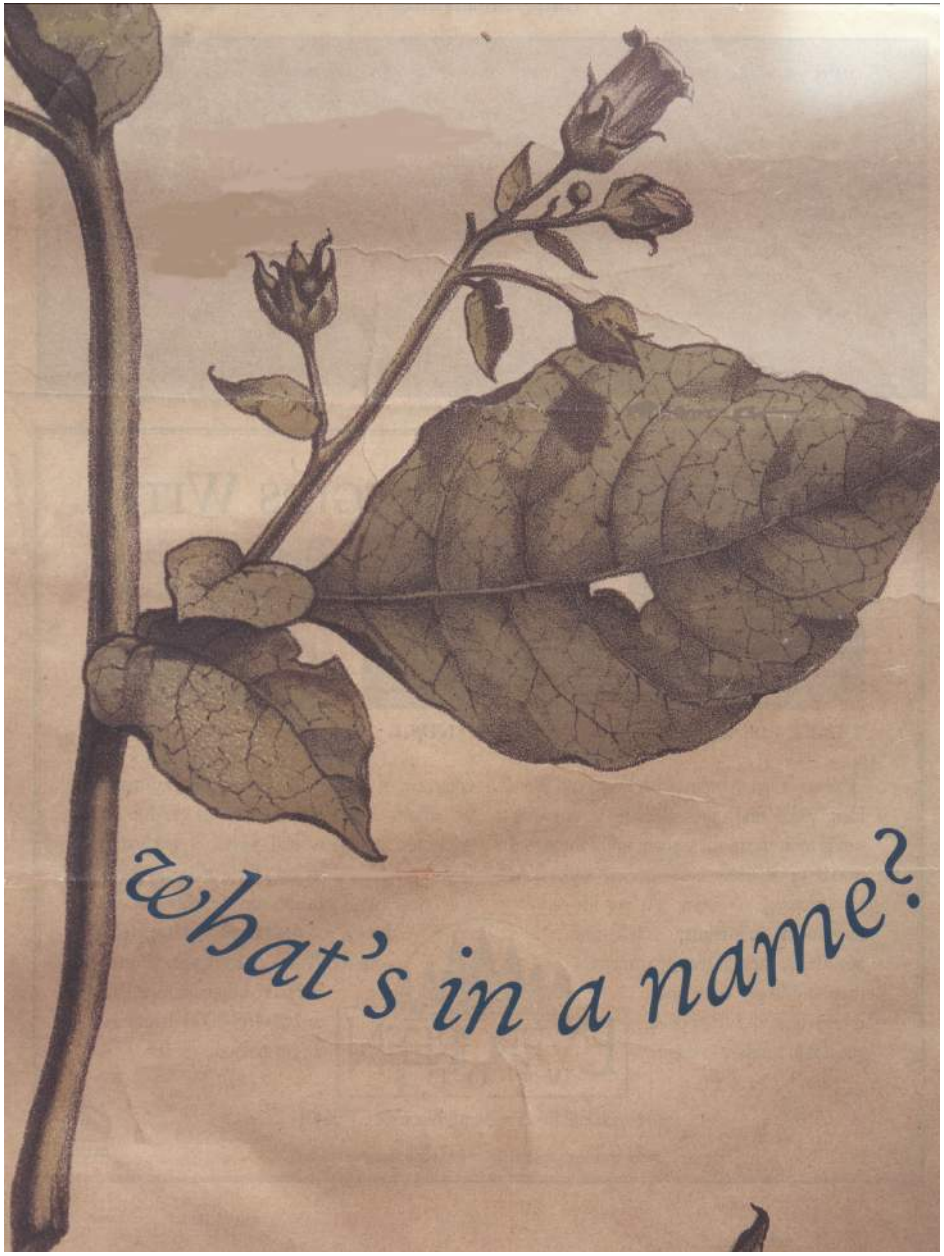

Nomenclature

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